

A Nonlinear Model for Designing Herschel-Quincke Waveguide Arrays to Attenuate Shock Waves from Transonic Turbofan Engines, Phase I

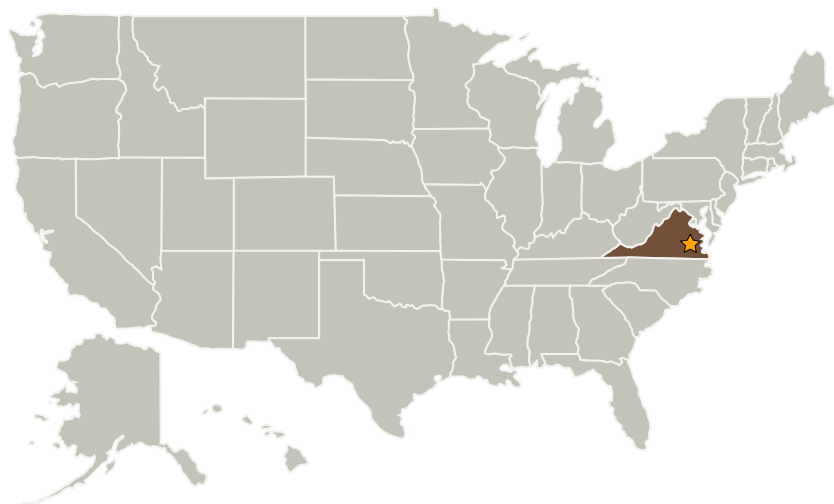
Completed Technology Project (2005 - 2005)



Project Introduction

Techsburg is teaming with the Vibration and Acoustics Laboratory of Virginia Tech to propose a non-linear analytical tool for designing Herschel-Quincke (HQ) waveguide arrays for the purpose of attenuating upstream-propagating shock waves in a transonic turbofan engine inlet. Techsburg will be receiving endorsement and support for this research from the Goodrich Company who owns the HQ waveguide array concept. Thus far linear acoustic modeling has been used to design HQ waveguide arrays that have experimentally proven to be successful in attenuating far-field sound radiation from subsonic ducted fans. However, the large transonic turbofan engines used in most civil aviation aircraft today produce large amplitude bow shocks upstream of the fan rotor that nonlinearly scatter energy from the dominant BPF circumferential mode near the fan rotor to primarily lower engine order circumferential modes at the duct entrance, which produces the "buzz-saw" far-field acoustic signature. The non-linear design tool developed by Techsburg/Virginia Tech in Phase I will be used to design an optimal HQ waveguide array in Phase II that will be placed near the fan with the intention of attenuating the BPF circumferential mode in order to reduce scattered energy into lower engine orders that cause far-field "buzz-saw" noise.

Primary U.S. Work Locations and Key Partners



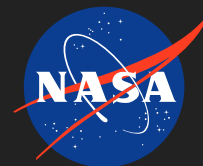
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Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Technology in Blacksburg, Inc.	Supporting Organization	Industry	Christiansburg, Virginia

Primary U.S. Work Locations

Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jason C Anderson

Technology Areas

Primary:

- TX01 Propulsion Systems
 - ↳ TX01.3 Aero Propulsion
 - ↳ TX01.3.4 Pressure Gain Combustion